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GB 1493402

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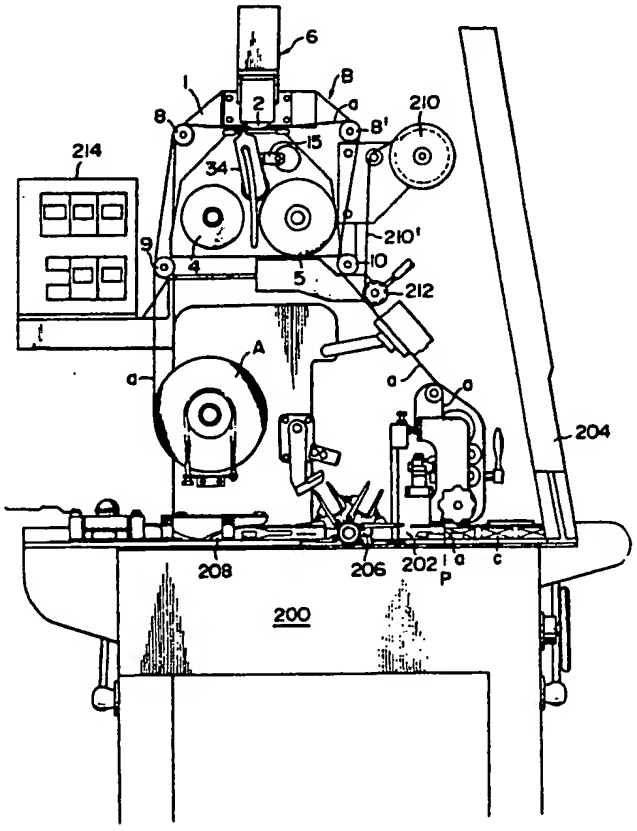
(54) Automatic packing machine

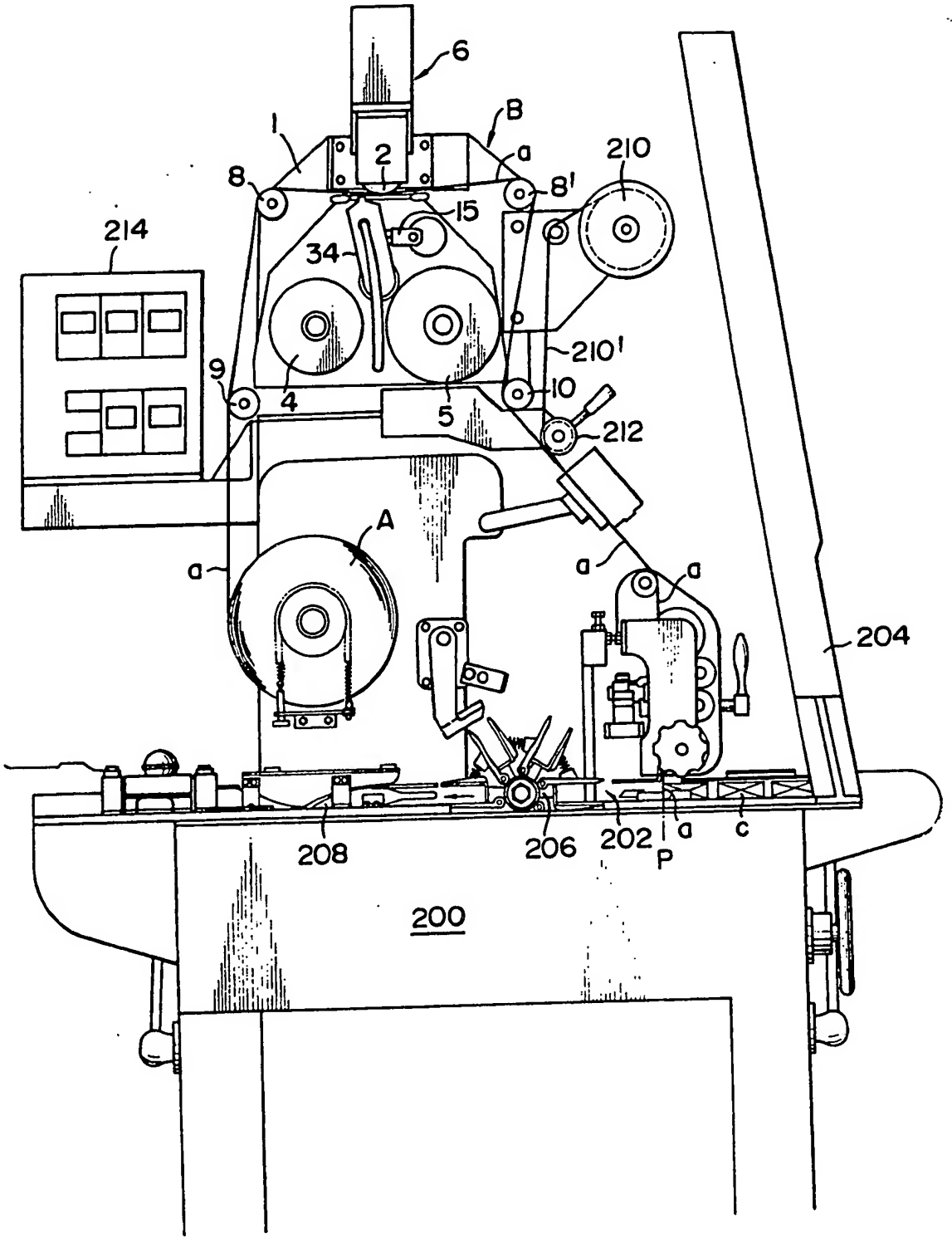
(57) A packing machine which successively draws out a packing sheet *a* from a wound roll A to automatically wrap packs of cigarettes C, confectionery or packed goods incorporates a printer B which prints required characters, symbols and numerals such as date of manufacture, machine number, etc. on the packing sheet. The packing machine is characterised in that said required matter is printed on the packing sheet before the articles packed are wrapped by said packing sheet; the printer involves a heated type head and an impression roller 2 co-operating with a printing tape running between reels 4.5. Preferably the type head reciprocaes under the impression roller on the end of a pivoting lever.

FIG. 1



GB 2 142 282 A

FIG. 1


6
B
1
2
a
210
8
8'
15
214
34
210'
9
4
5
10
212
A
a
a
a
204
208
206
202
P
a
c
200

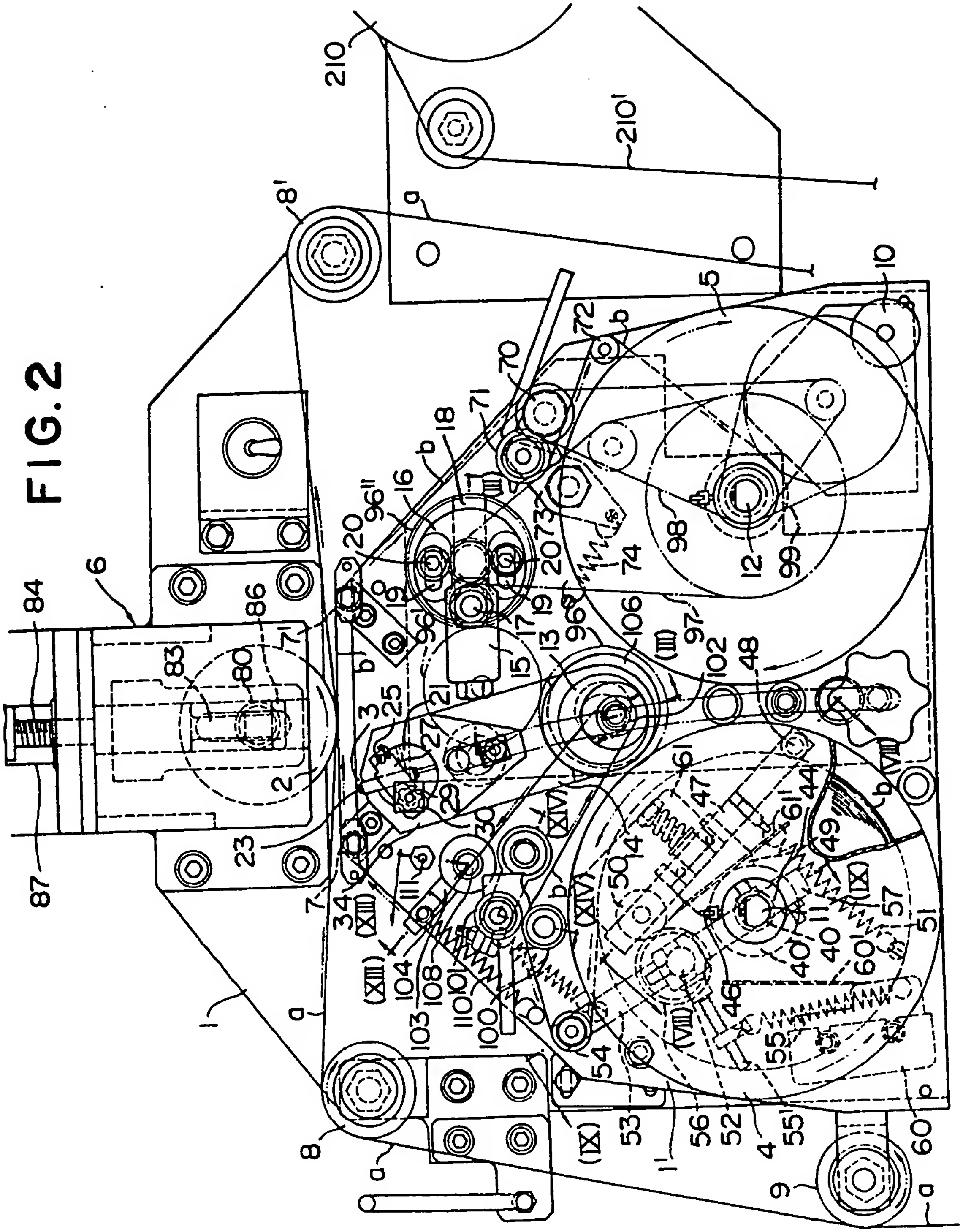


FIG.2

FIG. 3

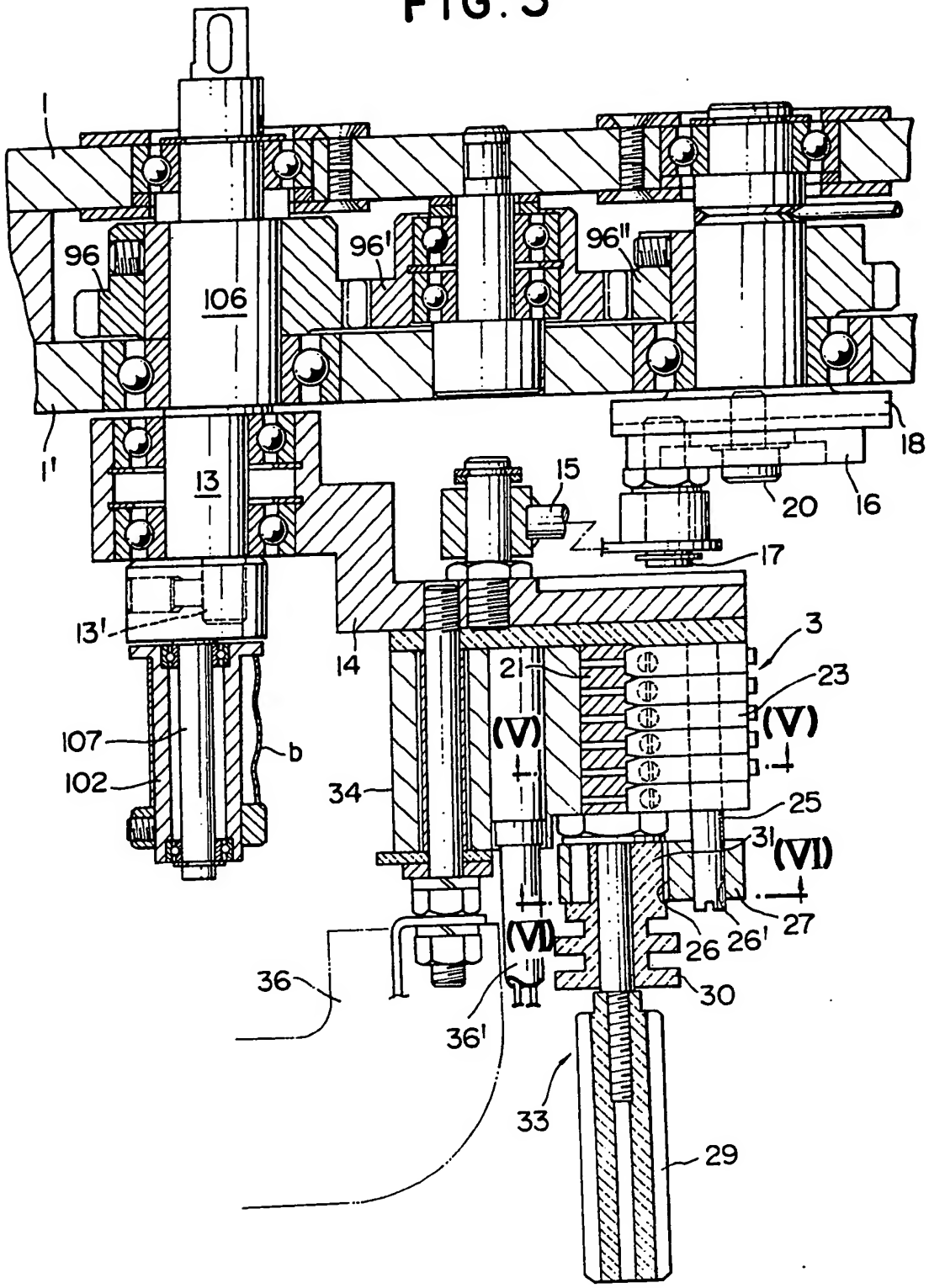

1
96
96'
96''
106
1'
13
18
15
20
16
17
13'
14
3
21
23
(V)
(V)
107
b
102
34
25
31
(VI)
27
26
26'
(VI)
36
30
36'
33
29

FIG. 4

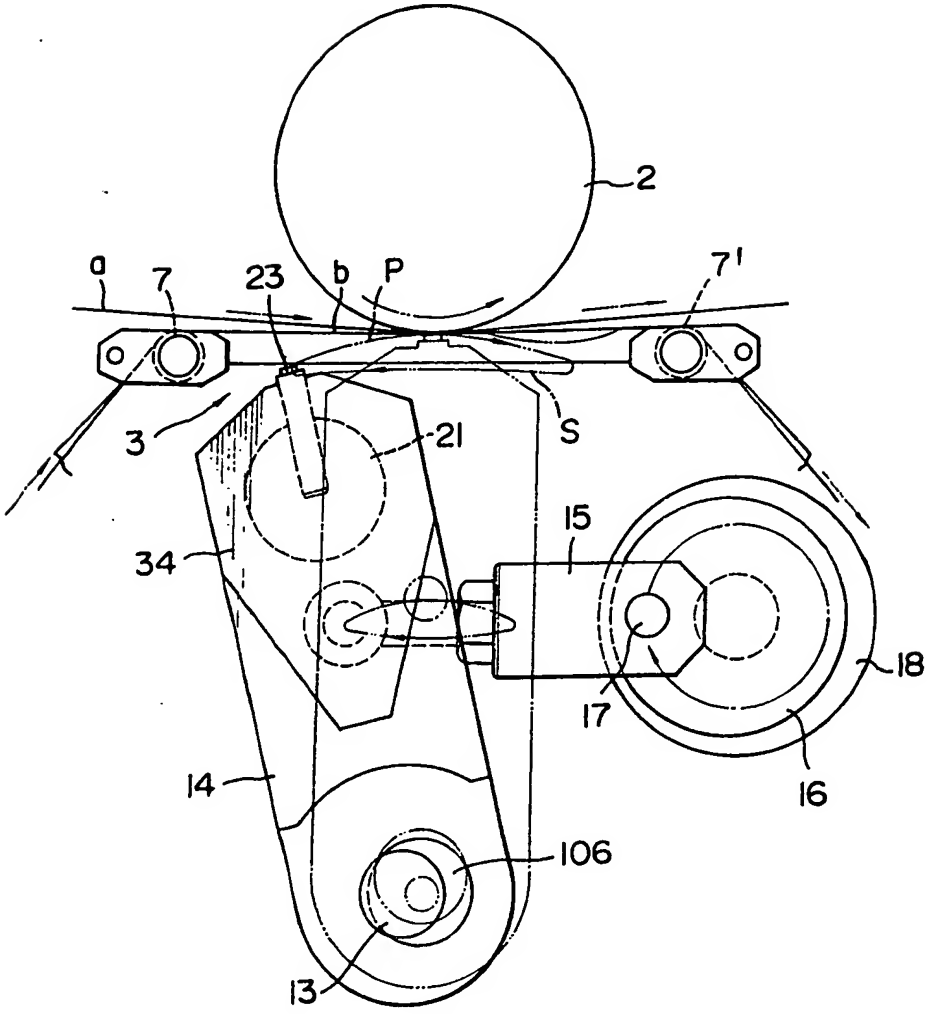


FIG. 5

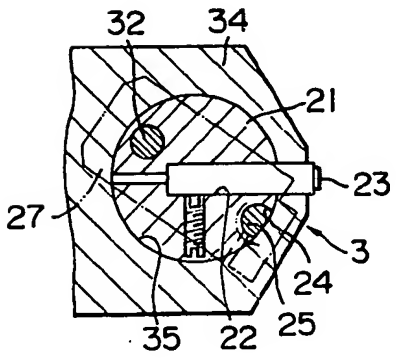


FIG. 6

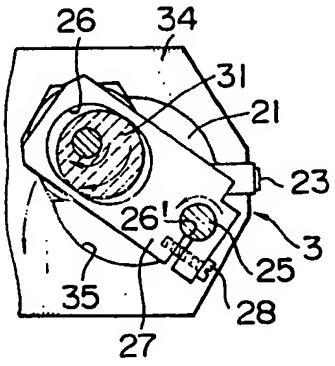


FIG.7

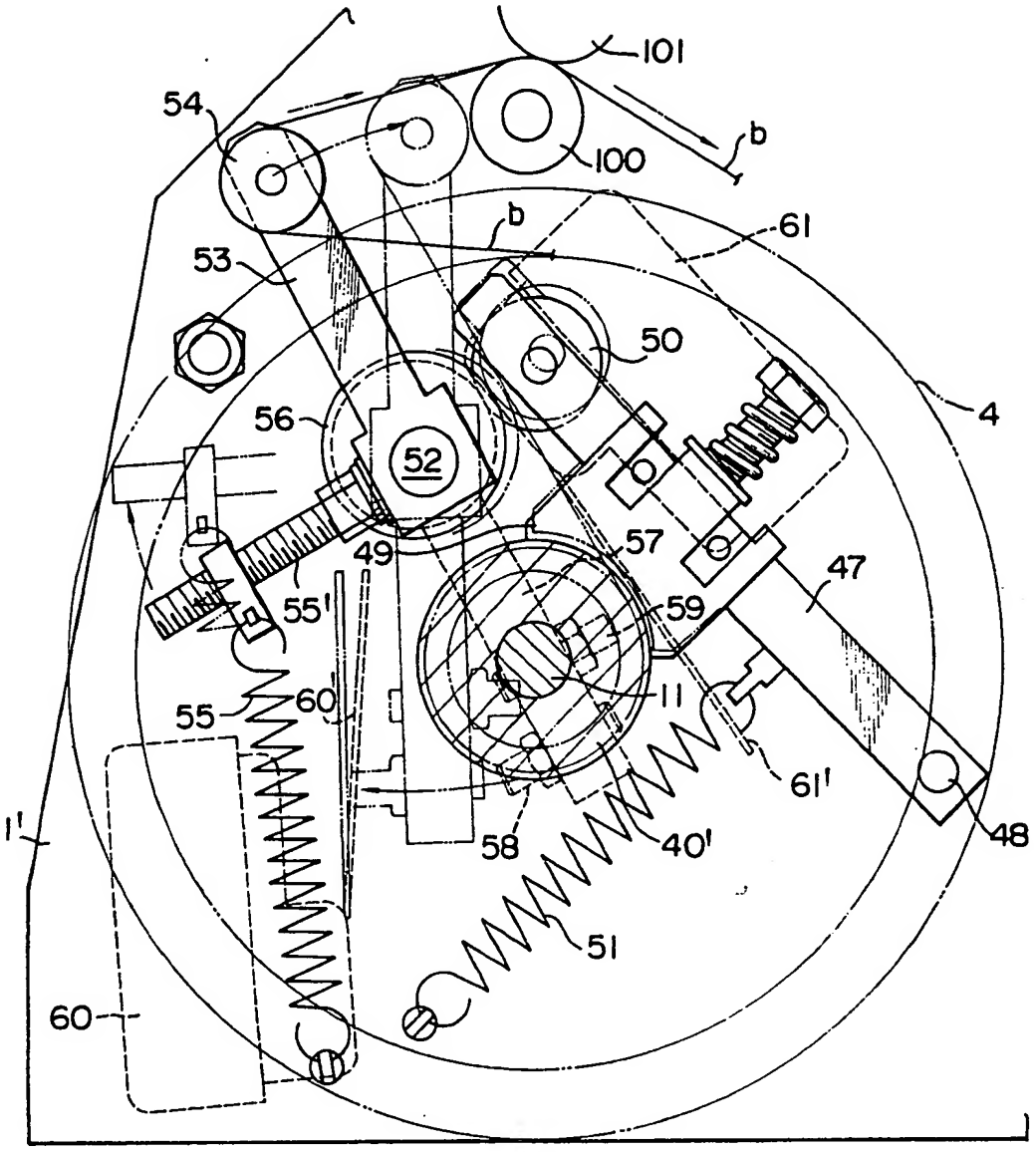

101
54
100
b
b
61
53
50
4
56
52
49
57
47
55'
59
55
60
11
61'
1'
58
40'
48
51
60

FIG. 9

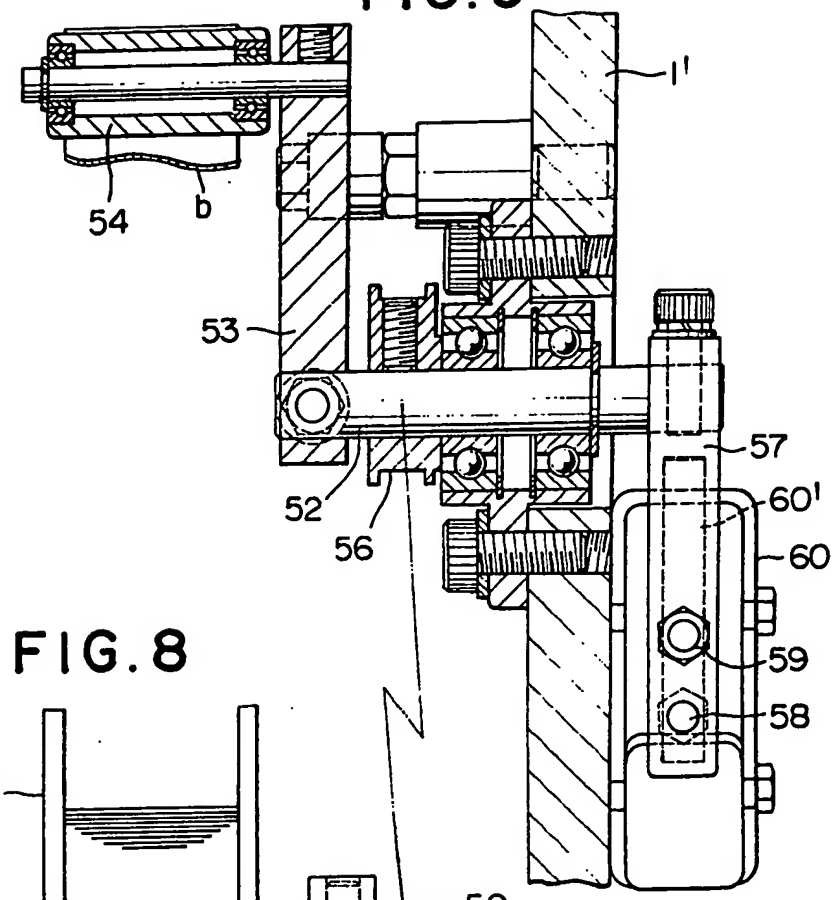

1'
54
b
53
57
52
56
60'
60
59
58

FIG. 8

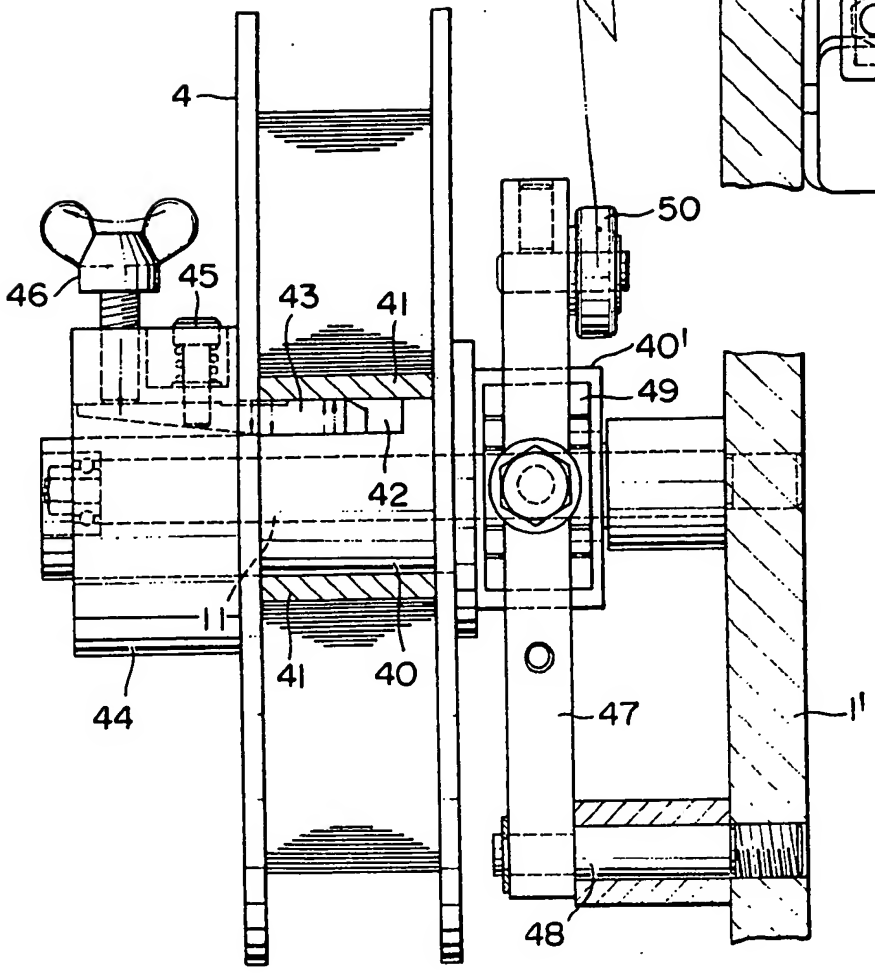

4
50
46
45
43
41
40'
49
42
11
41
40
44
47
1'
48

FIG. 10

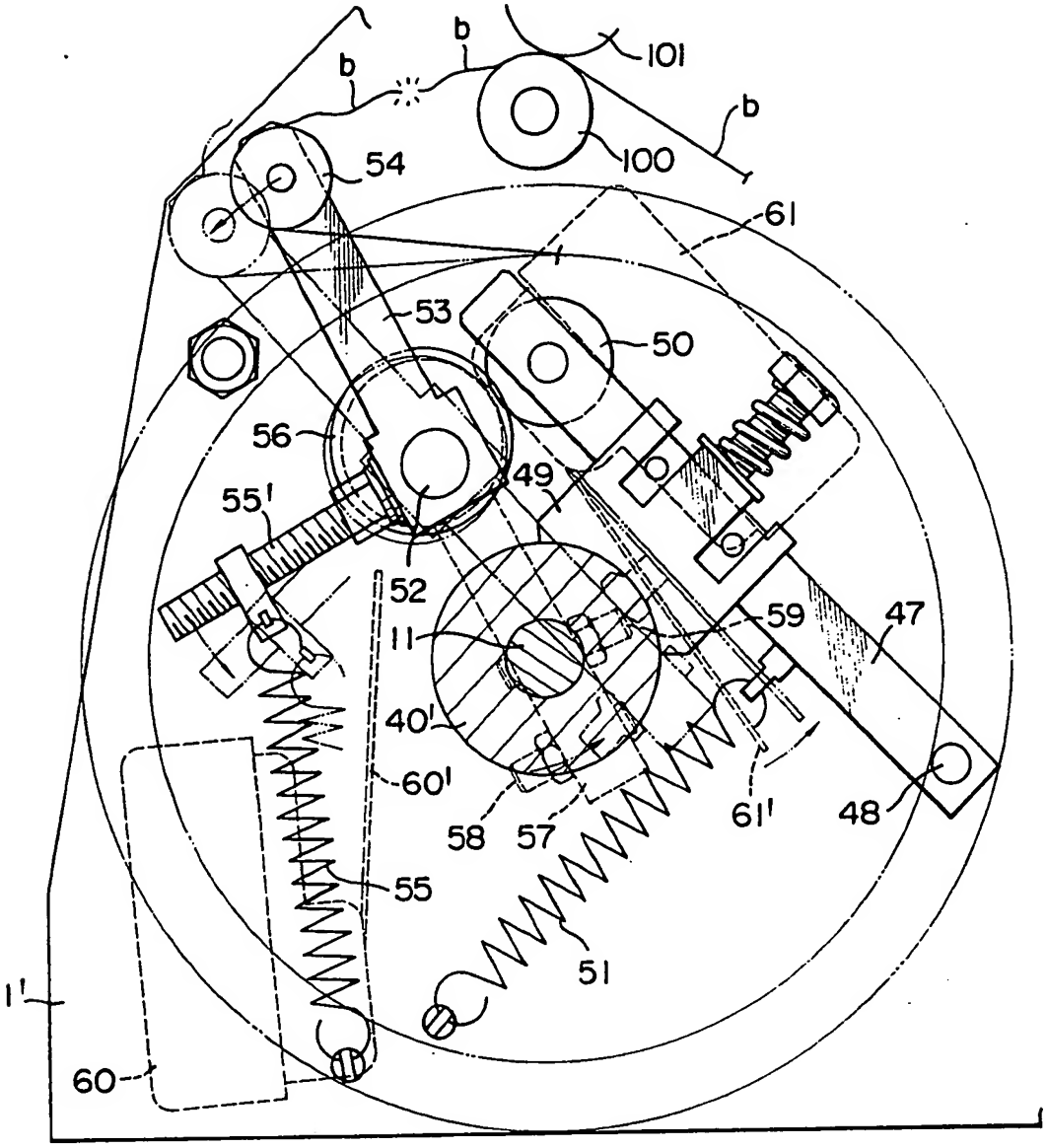

b
b
b
101
100
54
61
53
50
56
49
55'
52
11
59
47
40'
60'
58
57
61'
48
55
51
1'
60

FIG. 11

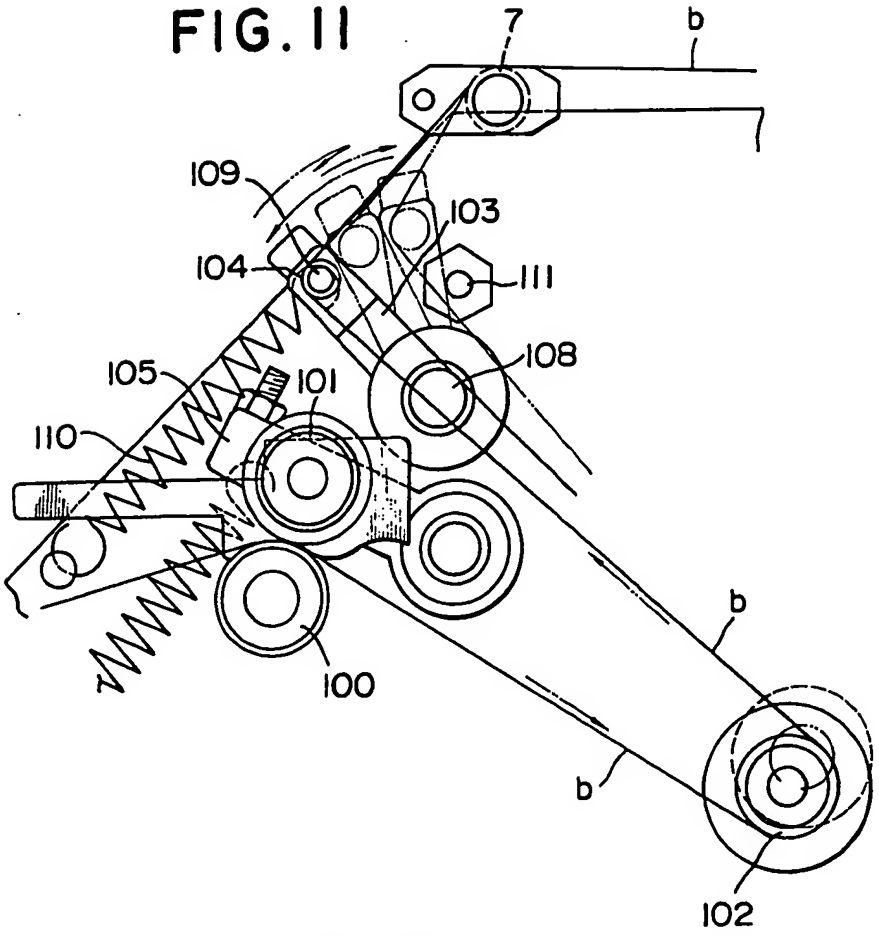


FIG. 12

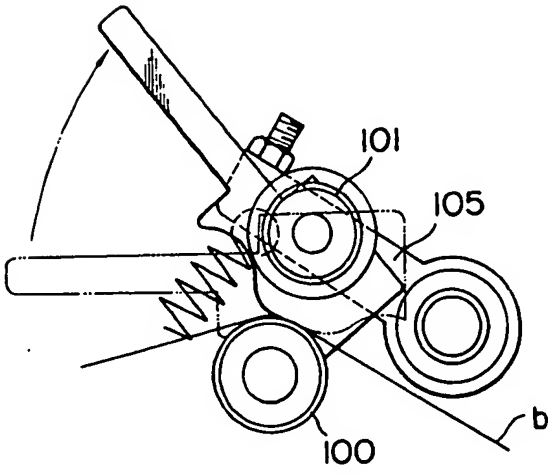


FIG. 13

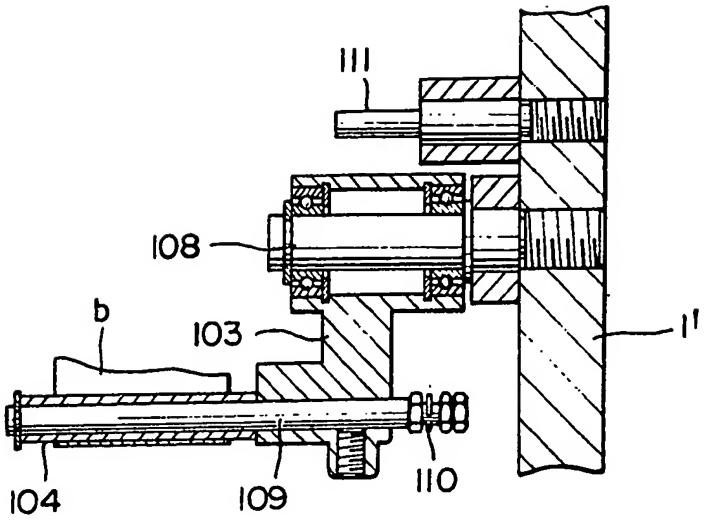


FIG. 14

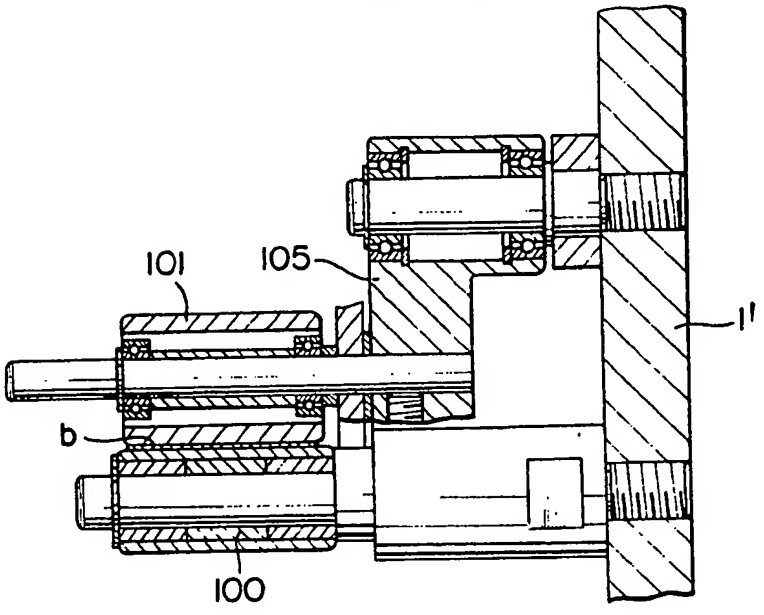


FIG. 15

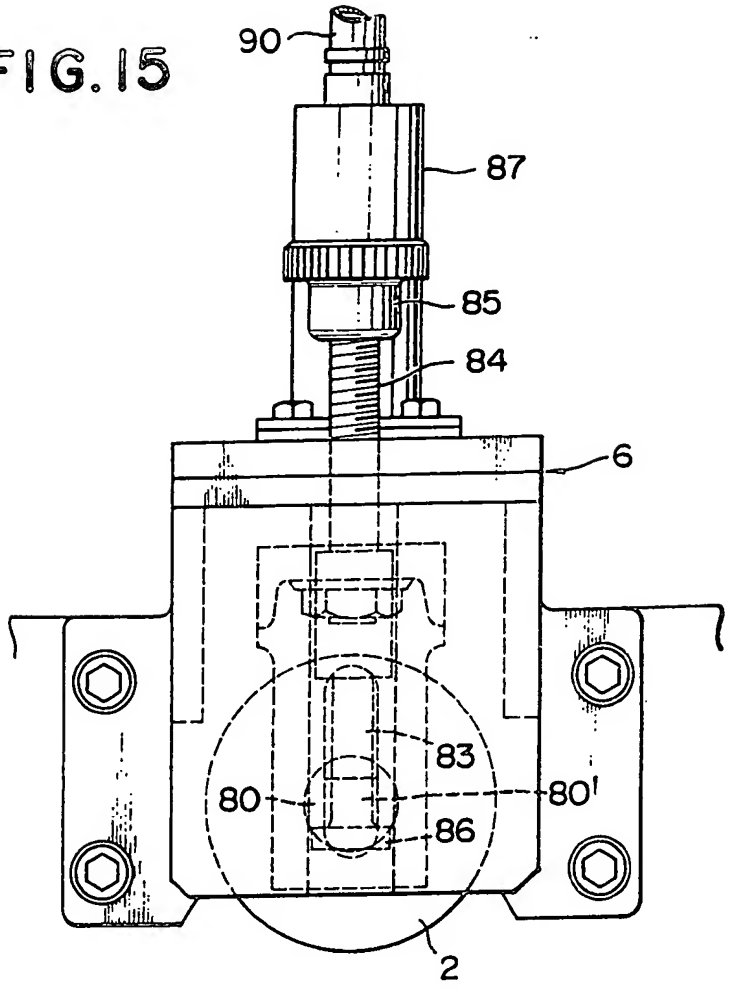


FIG. 17

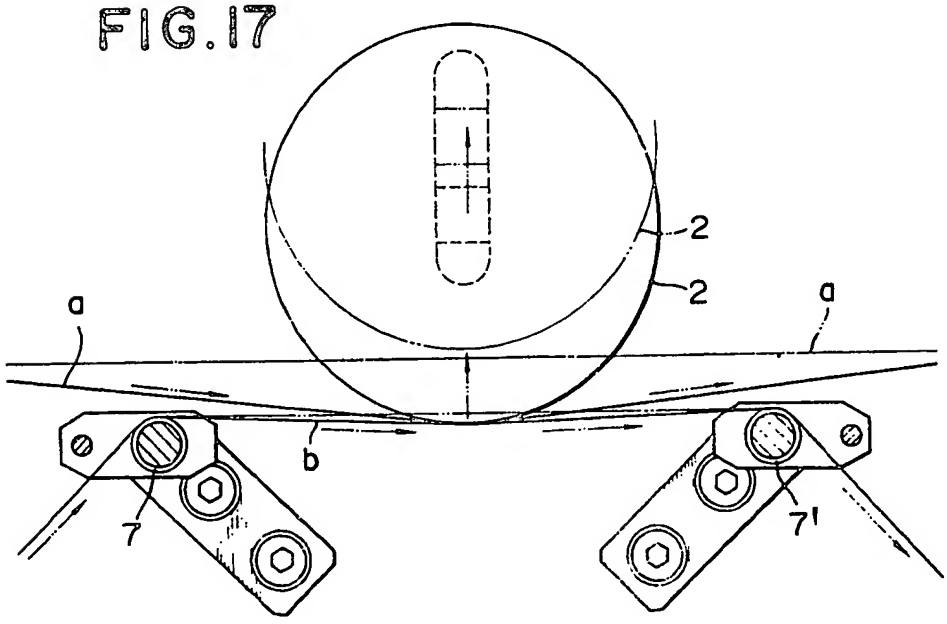


FIG.16

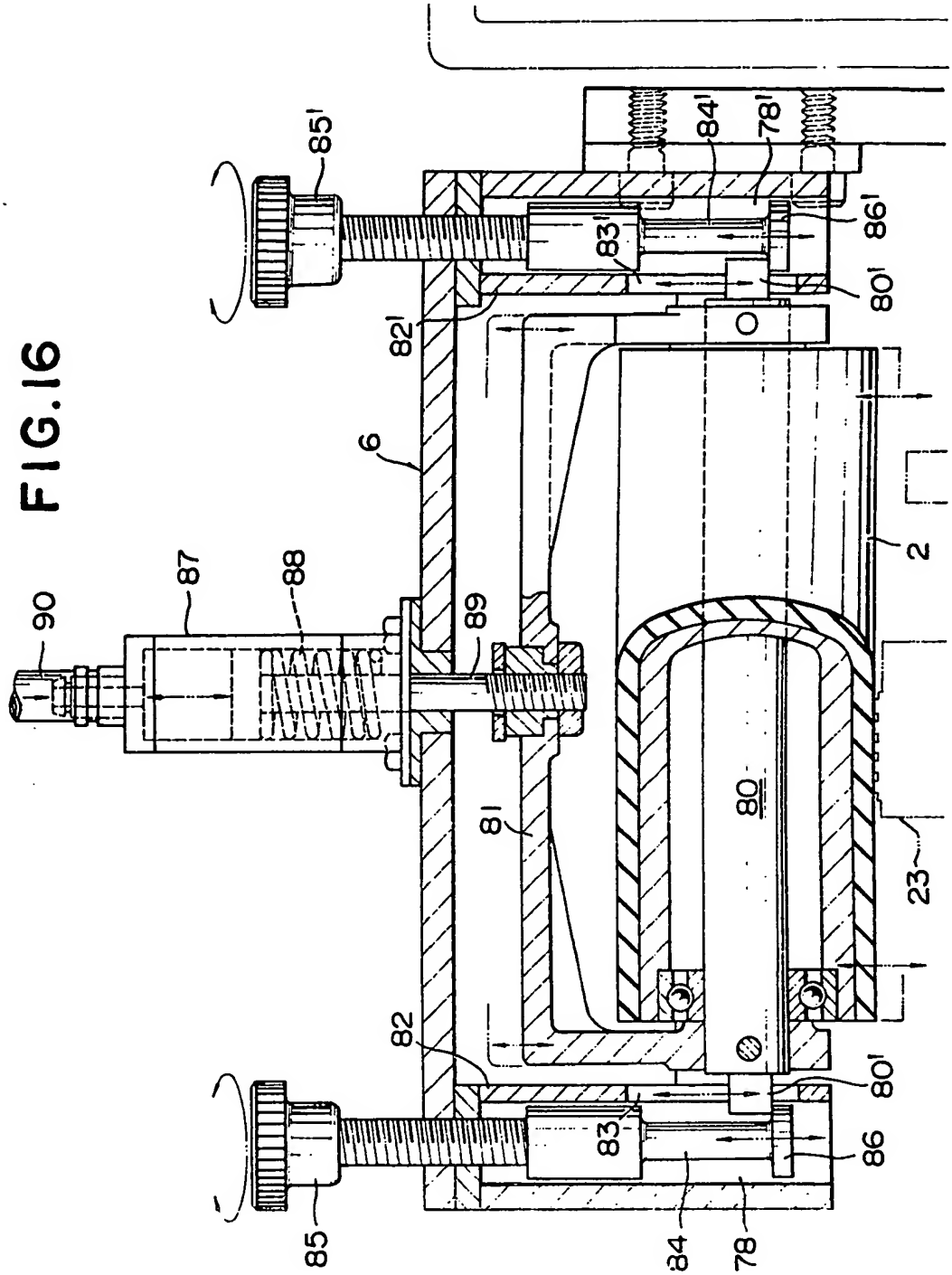


FIG. 18

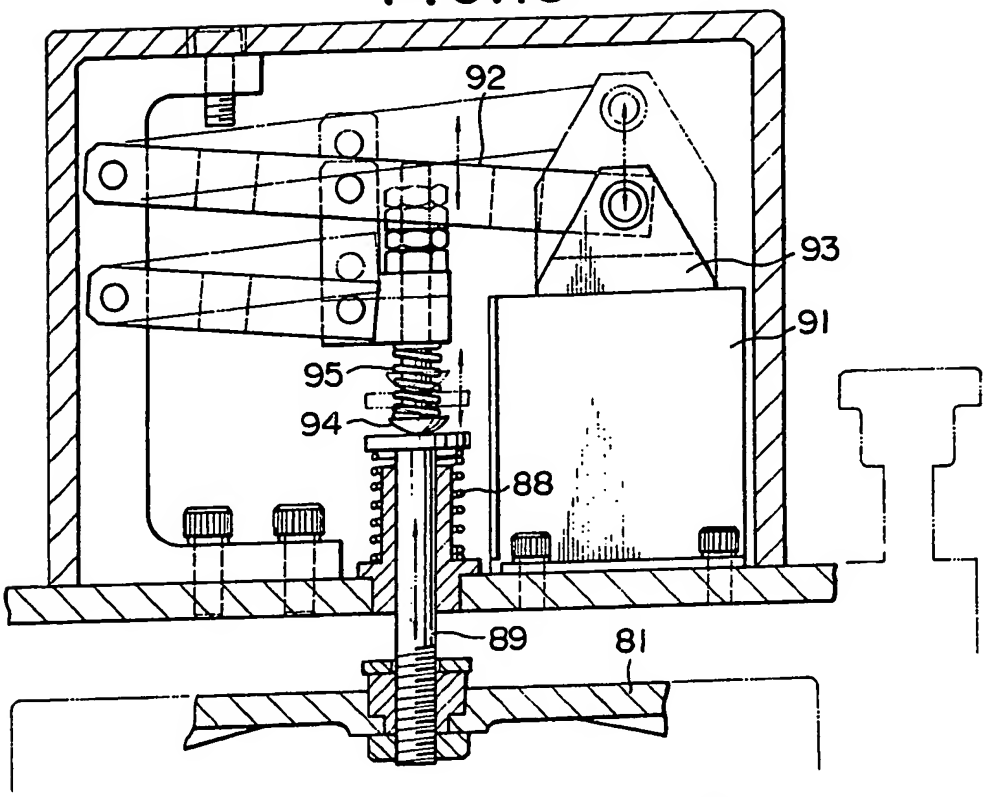

92
93
91
95
94
88
89
81

FIG. 19

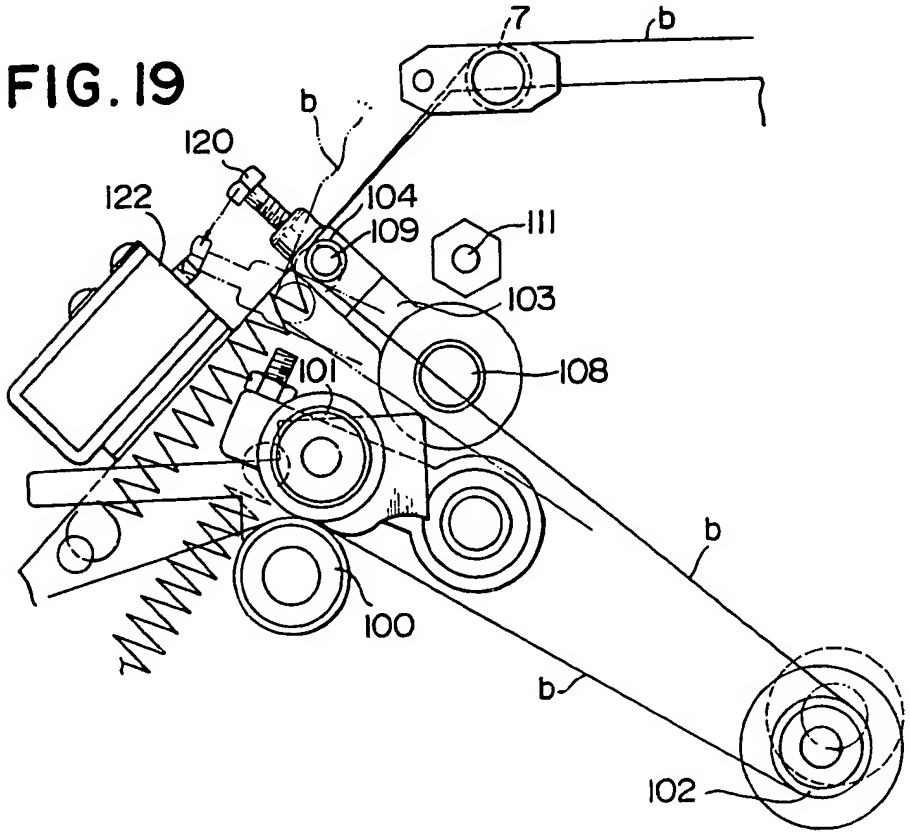

7
b
b
120
122
104
109
111
103
101
108
b
100
b
102

FIG. 20

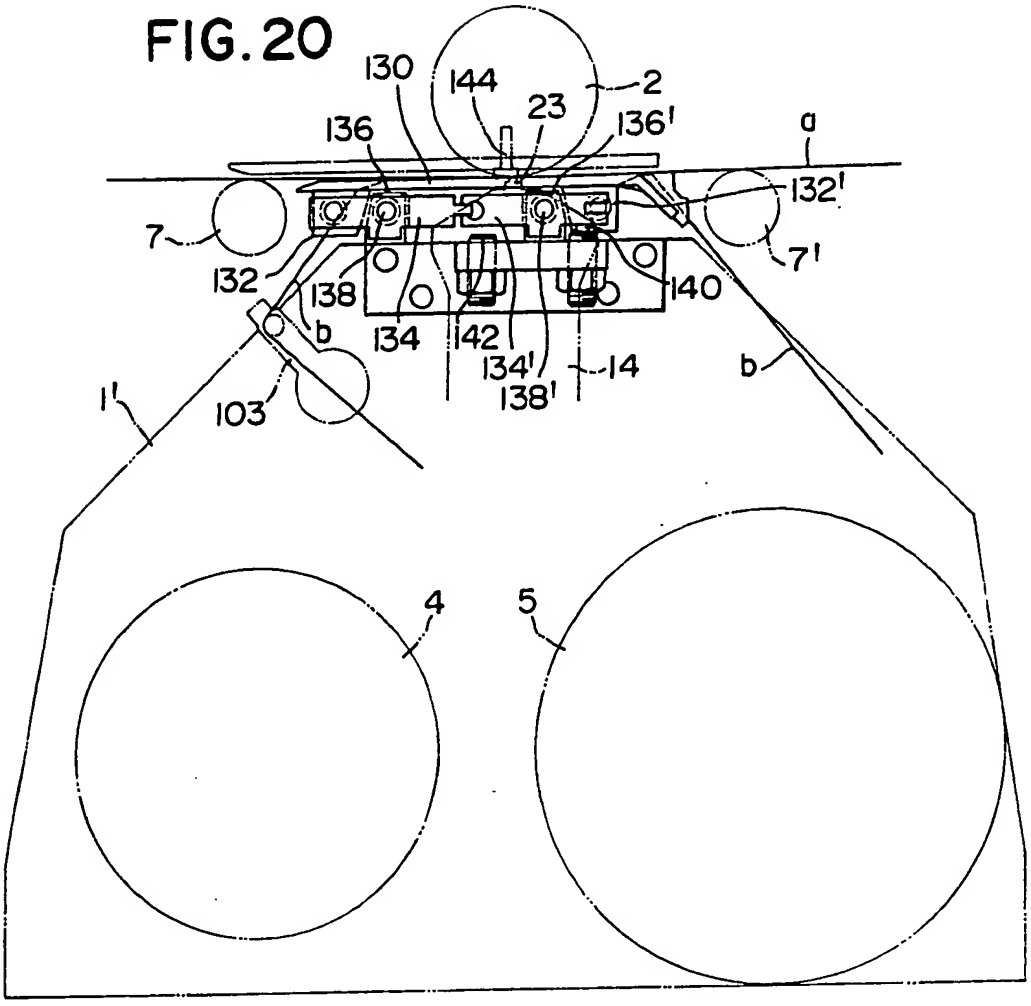

130
144
2
23
136
136'
a
132'
7
7'
132
138
140
b
134
142
134'
14
b
1'
103
138'
4
5

FIG. 21

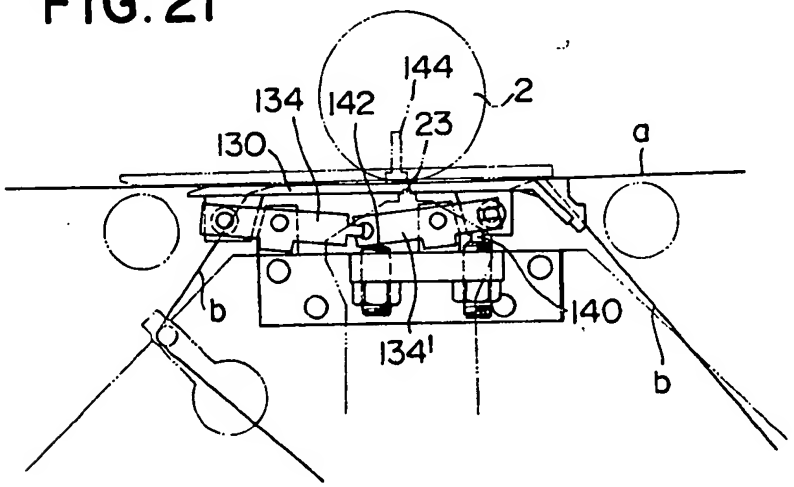

144
134
142
2
23
130
a
b
140
134'
b

FIG. 22

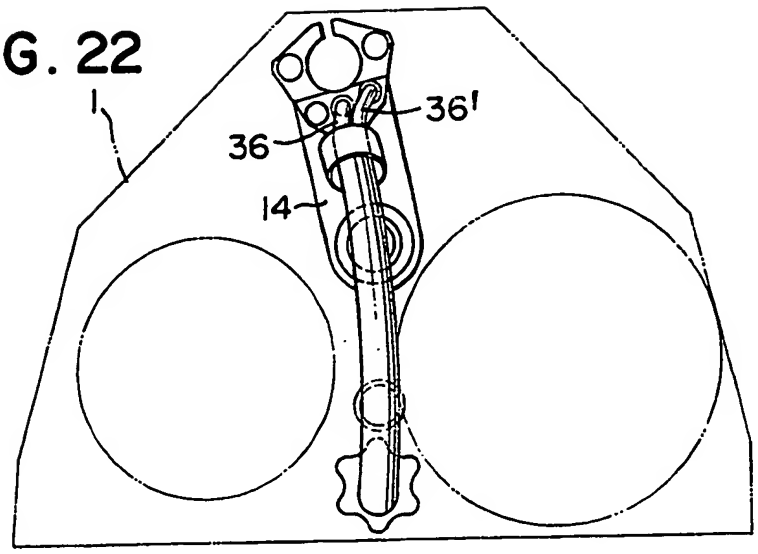


FIG. 23

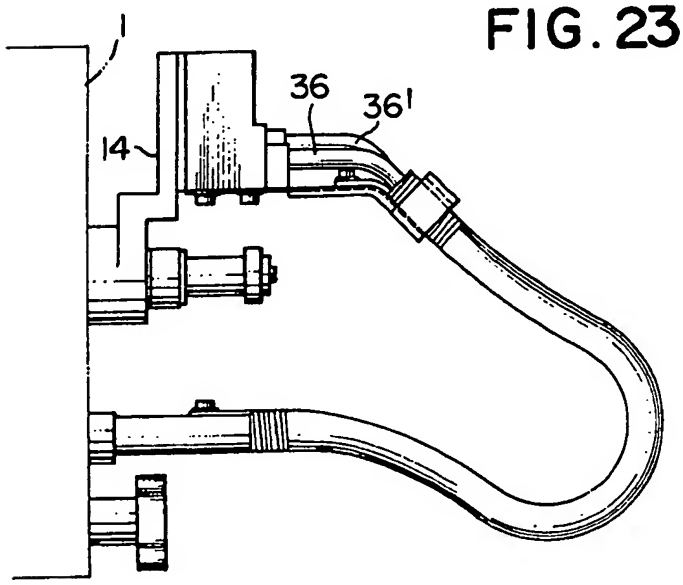
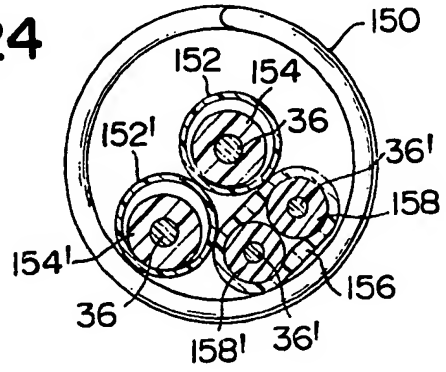


FIG. 24



SPECIFICATION

Automatic packing machine

This invention relates to automatic packing machines, and more specifically, to an apparatus which successively draws out a packing sheet from a roll of packing sheets wound into the form of a roll to automatically pack articles packed such as packs of cigarettes, confectionery or packed goods by said packing sheet and particularly to an automatic packing machine for the articles packed in which require characters, symbols and numerals such as date of manufacture, machine number and the like need to be printed on the packing sheet.

In conventional packing machines, where printing is applied to the packing sheet, a printer is installed either on the unloading end of the packing machine, or at a position away from the packing machine to pack the articles packed by the packing machine, that is, to wrap the articles packed by the packing sheet, after which printing is applied to the packing sheet by said printer. However, the conventional packing machine requires the printing step after the packing step and therefore has the inconveniences that it is not possible to achieve a high speed operation, and that the floor space required for installation of the machine is increased such that a compact mode of arrangement is not possible.

It is an object of the present invention to provide, in order to overcome the inconveniences noted above with respect to prior arts, a packing machine wherein a printer is incorporated into the packing machine itself so that printing is applied to a packing sheet during the time that the packing sheet, drawn out of a roll of packing sheets, is transported to a packing position, that is, printing is applied by said printer to the packing sheet before the article packed is wrapped, to thereby increase working property and reduce the floor space required for installation of the machine.

It is a further object of the present invention to improve said printer to provide a printer construction which can be adapted for high speed printing operation, which can effectively use a printing tape, and which has good using property.

In accordance with the present invention, there is provided a packing machine including a roll of packing sheets into which packing sheets are wound and a printer are disposed on a machine body of the packing machine, and a packing sheet drawn out of said roll is drawn out to a packing position through the printer, in which printer the packing sheet is transported under a receiving roll, a printing tape drawn out of a tape reel and wound on an empty reel is disposed along said packing sheet, and a heated type head is pressed against the receiving roll through the packing sheet and printing tape for rotation to apply printing to the packing sheet. There is further provided an improved printer characterised in that a drawing roller for drawing out the printing tape under the receiving roll by a fixed amount towards the empty reel is provided on the side of the empty reel, and between the tape reel and the receiving roll are provided a tape draw-in mechanism for pulling out the printing tape from the tape reel in accordance with the drawn amount of said drawing roller for supplement thereof and an auxiliary tension lever for always urging the printing tape under the receiving roll in a returning direction, said lever being pivotally mounted.

It should be noted that the aforementioned packing machine can be of any specific construction as long as the article packed is packed by the packing sheet drawn out through the printer using automatic and mechanical means.

The packing material is formed from synthetic resin film or a sheet of paper, and date of manufacture, machine number, lot number, other characters, symbols or numerals are printed by the type head on the packing sheet using the printer.

Mounting of said type head can be accomplished by either an operating arm for pivotal motion or a drum for rotational motion. However, the former may be of the simple construction, for the purpose of changing a linear speed of the head, as compared with the latter which requires a variable device.

In order that the invention may be more readily understood, embodiments of the invention will now be described, by way of example, reference being made to the accompanying drawings, in which:–

Figure 1 is a front view of a packing machine in accordance with the present invention;

Figure 2 is an enlarged front view of a printer section of said machine;

Figure 3 is a sectional view taken on line (III)–(III) of Fig. 2 with a sectional view of an upper half portion of an operating arm incorporated therein;

Figure 4 is an enlarged front view of a printing portion of the apparatus of Fig. 1;

Figure 5 is a sectional view taken on line (V)–(V) of Fig. 3;

Figure 6 is a sectional view taken on line (VI)–(VI) of Fig. 3;

Figure 7 is an enlarged front view of a rear portion of a tape reel forming a part of the apparatus;

Figure 8 is a sectional view taken on line (VIII)–(VIII) of Fig. 2;

Figure 9 is a sectional view taken on line (IX)–(IX) of Fig. 2;

Figure 10 is a front view of a rear portion of the tape reel for explanation of the state where the tape is cut;

Figure 11 is an enlarged front view of an essential portion of the tape reel;

Figure 12 is a front view of a guide part of Fig. 11;

Figure 13 is a sectional view taken on line (XIII)–(XIII) of Fig. 2;

Figure 14 is a sectional view taken on line (XIV)–(XIV) of Fig. 2;

Figure 15 is an enlarged front view of a roll holder forming a part of the apparatus of Fig. 1;

Figure 16 is a sectional side view of said roll holder;

Figure 17 is an enlarged front view for explanation of the operation of a receiving roll;

Figure 18 is a sectional side view showing a modified form of roll holder;

Figure 19 is a front view showing a modified form in which a mechanism for detecting cutting of a printing tape is provided around an auxiliary tension lever;

Figure 20 is a front view showing a guide construction of the printing tape under the receiving roll and a film sheet;

Figure 21 is a front view for explanation of the operation of the guide construction of Fig. 20;

Figure 22 is a front view showing a wiring construction of a heater lead wire and a sensor lead wire;

Figure 23 is a side view of the construction of Fig. 22; and

Figure 24 is a sectional view of a bundle of lead wires.

Referring to the drawings, Fig. 1 shows a packing machine for packing an outer cover (a transparent synthetic resin film) for, for example, a pack of cigarettes. Reference numeral 200 designates a machine body, on which is formed a conveying passage 202 which successively transports packs of cigarettes, externally packaged in another packing step, one by one in a direction as indicated by the arrow.

The conveying passage 202 is provided at a loading end (at the right end in Fig. 1) thereof with a hopper 204 through which packs of cigarettes may be dropped one by one into the conveying passage 202. A drawing out position *P* at which is adapted to hang down a film sheet *a* as a packing material in a vertical direction is set forwardly of the hopper 204. A turret 206 which constitutes a folding mechanism for the sheet *a* is provided forwardly of the position *P*. An edge folding mechanism 208 for the sheet *a* is provided forwardly of the turret 206, and a sealing mechanism (not shown) is suitably disposed in the vicinity of the turret 206 and edge folding mechanism 208.

On the machine body 200 are provided a roll *A* of packing sheet into which the film sheet *a* is wound, said roll being located above the conveying passage 202 and being rotatable, and a printer *B*, the film sheet *a* being drawn out of the roll *A* and passing to the drawing out position *P* of the conveying passage 202 through the printer *B*.

The sheet *a* is cut in required length by means of a cutter (not shown) provided at a position distanced from and above the position *P* and is held in a state where it vertically crosses the conveying passage 202 at the position *P*.

In the drawing, reference numeral 210 denotes a roll for drawing out a ribbon-like tear tape 210′, which tape is adhered to the film sheet *a* while being guided by means of a roller 212. Reference numeral 214 designates a console section of the printer *B*.

In the packing machine, packs of cigarettes *C* travelling on the conveying passage 202 impinge upon the film sheet *a* at the drawing out position *P* and are forced into the turret 206 whereby the packs of cigarettes *C* are wrapped by the sheet *a* in a fashion of a bellyband, and both upper and lower ends of the sheet *a* are folded together and sealed while the turret 206 is rotated through 180 degrees, whereafter the packs of cigarettes *C* travel on the conveying passage 202 during which both edge portions of the sheet *a* are folded in and sealed along the side ends of the packs of cigarettes *C*.

Fig. 2 and other figures show the details of the printer *B*. In these Figures, reference numeral 1 designates a machine frame, reference numeral 1′ designates support plates which are upright and spaced apart on the front surface of the machine frame, and reference numeral 2 designates a receiving roll made of rubber. Reference numerals 3, 4, and 5 respectively designate a type head, a tape reel and an empty reel, whilst the film sheet is designated *a* and a printing tape is designated *b*.

The receiving roll 2 is rotatably mounted on a roller holder 6 mounted in a central portion of the upper part of the machine frame 1, guide rollers 7, 7′ for moving the printing tape *b* under the receiving roll 2 in a horizontal direction being journalled on both left and right sides, respectively, immediately under the receiving roll 2. Guide rollers 8, 8′ for moving the film sheet *a* are rotatably journalled outwardly of said receiving roll 2.

The film sheet *a* is drawn out of the aforesaid roll *A* through a guide roller 9 provided on the lower side of the machine frame 1 and applied with required printing during the passage of the film sheet between said guide rollers 8, 8′, the printed sheet then being delivered to the drawing out position *P* via a guide roller 10.

The film sheet *a* is moved at a constant speed between the guide rollers 8, 8′ by means of a drawing out roller not shown. The moving speed of the film sheet *a* can be suitably varied.

The tape reel 4 and empty reel 5 are rotatably slipped over and supported on shafts 11 and 12 projecting from the lower regions of the support plate 1', an eccentric shaft 13 being rotatably mounted in an upper central portion of said support plate 1' between the reels 4 and 5. The lower end of an operating arm 14 is rotatably engaged on the eccentric shaft 13.

The operating arm 14 having its upper portion projected between the guide rollers 7 and 7', has a type head 3 detachably mounted on the upper end thereof, and has an extreme end of a drive lever 15 of a crank motion connected to a substantially central portion thereof, whereby the operating arm 14 is laterally pivotally moved under the receiving roll 2 upon crank motion of said lever 15 (Figs. 2 and 3).

The operating arm 14 is moved up and down by rotation of the eccentric shaft 13, and a combination of this upward and downward movement and the aforesaid pivotal movement results in the type head 3 reciprocating as shown by arrow *S* of Fig. 4. At the apex position during said reciprocating operation, the type head 3 is momentarily pressed against the receiving roll to provide printing timing (Fig. 4).

The drive lever 15 has one end connected to an eccentric position of a rotary plate 16 by means of a pin 17, and the drive lever 15, the rotary plate 16 and the pin 17 constitutes a crank mechanism, said rotary plate 16 being attached to a rotary disc 18 rotatably mounted on the front surface of the support plate 1' so that the crank length with respect to the rotary disc 18 may be adjusted by slots 19, 19 and upper bolts 20, 20.

Since the crank mechanism is made adjustable in crank length as described above, a linear speed at which the extreme end of the operating arm 14, i.e. the type head 3, is pivotally moved, can be varied according to the travelling speed of the film sheet *a*. If the linear speed is set to almost 0, the type head 3 may be moved up and down with little pivotal movement, and printing can be effected even in a state where the film sheet *a* is stopped.

The type head 3 comprises the required number of types 23, 23, . . . inserted into a length groove 22 of a drum-like holder 21. This holder 21 is formed with an arcuate groove 24 lengthwise of a peripheral surface thereof and an engaging shaft 25 is fitted into said groove 24. A receiving member 27 bored with a slot 26 and a circular hole 26' is joined on the end of the holder 21, and the extreme end of the engaging shaft 25 is inserted into the circular hole 26' and fixed by means of a pin 28.

An operating shaft 33 comprising a grip 29, a knob 30, a cam 31 and a screw 32 is integrally connected to the end of the holder 21 by tightening the screw 32, and the cam 31 is fitted into the slot 26 of the receiving member 27 (Figs. 3, 5 and 6).

In the type head 3, the holder 21 thereof is frontwardly inserted into a fitting hole 35 of a support disc 34 secured to the upper front surface of the operating arm 14, the knob 30 is rotated to secure the holder 21 to the fitting hole 35, and the knob 30 is reversely rotated so as to be disengaged therefrom to render it detachable.

The support disc 34 has a heating source connected to a heater lead wire 36 to heat the types 23, 23, the wire 36 passing through the holder 21 and having a sensor lead wire 36' connected to a temperature sensor to detect the temperature of the types 23 to maintain the types 23, 23, at a required temperature.

The tape reel 4 is rotatably mounted on the shaft 11 but a sleeve 40 having a brake disc 40' provided at one end thereof is rotatably mounted on the shaft 11, and a reel portion of the tape reel 4 is detachably inserted into the sleeve 40.

The sleeve 40 is formed in the outer periphery with a key way 42, into which a key 43 may be inserted. The key 43 has one end formed into a convergent configuration, which end is mounted along an internal surface of a hole of a cylinder 44 fitted in the outer periphery of the sleeve 40.

The cylinder 44 has a normally outwardly urged bolt 45 and a butterfly screw 46 mounted thereon in a parallel fashion, said butterfly screw 46 being placed in contact with an upper surface of the converged end of the key 43 and having a forward position thereof threadedly fixed by the bolt 45, said key 43 being hung and supported for pivotal movement up and down, said key 43 being projected frontwardly (Fig. 8).

In the cylinder 44, the tape reel 4 is inserted into the sleeve 40, after which the key 43 is inserted into the sleeve 40 while being moved along the key way 42 and the butterfly screw 46 is tightened whereby the key 43 is pressed against and brought into engagement with the inner surface of the sleeve 40 for rotation therewith, and the butterfly screw 46 is loosened to thereby disengage the key from the reel portion 41 to remove the cylinder 44 so that the tape reel 4 may be exchanged.

In the vicinity of the shaft 11 there is provided a brake lever 47 which is pivotable so that it is located on the back of the tape reel 4.

The brake lever 47 has its lower end pivotally supported on the support plate 1' by means of a pin 48 so that it may be pivotably moved, and a brake shoe 49 is provided halfway thereof so as to come into contact with the brake disc 40' of the sleeve 40, a roller 50 being rotatably provided at the up-

per end thereof.

The brake lever 47 is biased by means of a spring 51 in a direction wherein the brake shoe 49 comes into contact with the brake disc 40′ (Figs. 7 and 8).

In the vicinity of the shaft 11, there is pivotably provided a tension lever 53 having a support shaft 52 at the left obliquely upper portion of the shaft 11, and a guide roller 54 is rotatably mounted on the extreme end of the lever 53.

The tension lever 53 is biased by means of a spring 55 and a connecting shaft 55′ so that the former may be normally pivotally moved downwardly, and the support shaft 52 is provided with a cam 56 which pushed up the brake lever 47 through the roller 50 when the lever 52 is upwardly pivotally moved against the resilience of the spring 55.

The support shaft 52 has its rear end projected towards the back of the support plate 1′ and a control lever 57 downwardly projected is integrally fastened to said rear end and associated with the pivotal movement of the tension lever 54 through the support shaft 52.

The control lever 57 has engaging elements 58, 59 projected on both left and right sides, respectively, at the lower end thereof, and the support plate 1′ has micro-switches 60, 61 provided on the back thereof, the engaging elements 58, 59 of the control lever 57 being brought into abutment with contacts 60′, 61′ respectively thereof.

The control lever 57 is downwardly pivotally moved in association with great upward pivotal movement of the tension lever 53 to bring the engaging element 58 into abutment with the contact 60′ to actuate the switch 60 and is upwardly pivotally moved when the tension lever 53 is greatly downwardly pivotally moved to bring the engaging element 59 into abutment with the contact 61′ to actuate the switch 61. It is designed so that either switch 60 or 61 is actuated to thereby stop driving of the printer *B*.

A printing tape *b* having an inner end attached to the reel portion 41 is wound into the tape reel 4, and the printing tape *b* is first wound back by the guide roller 54 of the tension lever 53 before being pulled out.

By pulling out the tape *b*, the tension lever 53 is upwardly pivotally moved by the tension thereof to push up the brake lever 47 through the cam 56 and roller 50 to move the brake shoe 49 away from the brake disc 40′, and therefore, the tape reel 4 becomes rotatable to draw out the tape *b* from the reel 4 and when the tension applied to the tension lever 53 is weakened, the lever 53 is downwardly pivotally moved to bring the shoe 49 into contact with the brake disc 40′ through the brake lever 47 to brake the tape reel 4.

At the tape end wherein the tape *b* on the tape reel 4 becomes used up, the start end of the tape is attached to the reel portion 41 and therefore, the tension lever 53 is powerfully pulled and upwardly greatly pivotally moved, and the engaging element 58 comes into abutment with the contact 60′ through the control lever 57 and thus the switch 60 is actuated to stop the printer *B* (see the dash-dotted contour lines in Fig. 7).

Where the tape *b* is cut halfway as shown in Fig. 10, the tension lever 53 is greatly downwardly pivotally moved by the spring 55, the engaging element 59 of the control lever 57 comes into abutment with the contact 61′ to actuate the switch 61 whereby the printer *A* stops (see the dash-dotted contour lines in Fig. 10).

The printing tape *b* is, after being guided by the guide roller 54, successively guided by guide rollers 100, 101, drawing-in roller 102 and a guide roller 104 provided on the extreme end of an auxiliary tension lever 103 and thence guided to said guide rollers 7, 7′ (Figs. 2, 11–14).

The guide roller 100 is rotatably mounted on the support plate 1′ at a position immediately above the tape reel 4, and the guide roller 101 is rotatably mounted on the extreme end of a lever 105 which is pivotally moved up and down and is provided to be open and closed and to and away from the roller 100.

The guide roller 100 is in the form of a unidirectional rotatable roller which is rotated only in a direction of drawing out the tape *b*, and the drawing roller 102 is integrally mounted on the front portion of the aforesaid eccennric shaft 13 in the illustrated embodiment (Fig. 3).

The eccentric shaft 13 has a core shaft 13′, which is coaxial with a rotational shaft 106 as a reference shaft thereof, integrally projected frontwardly, a roller shaft 107 is made eccentric with respect to the core shaft 13′ and integrally fastened thereto, and said drawing-in roller 102 is rotatably mounted on the shaft 107.

Thus, the drawing-in roller 102 is also eccentric with respect to the rotational shaft 106. However, the drawing-in roller 102 is not necessarily mounted on the front portion of the eccentric shaft 13 but can be made independent.

The aforesaid guide rollers 100, 101 and drawing roller 102 constitute a tape drawing-in mechanism.

The drawing-in roller 102 is moved up and down by rotation of the rotational shaft 106, by which operation the printing tape *b* is drawn out from the tape reel 4 through the guide rollers 54 and 100, 101. The amount of tape drawn-in by the drawing-in roller 102 is set to a fixed amount which supplements the drawn-out amount according to the drawn-out amount of the drawing-out roller 70 which will be described hereinafter.

A drive source (not shown) for the printer *B* is connected to the rotational shaft 106.

The auxiliary tension lever 103 is disposed above the guide roller 101 and is pivotably mounted on a support shaft 108 extending from the support plate 1′ with the lower end thereof made rotatable, and a shaft 109 is frontwardly projected from the extreme end of the lever 103, said shaft 109 having the guide roller 104 rotatably mounted thereon.

At the rear end of the shaft 109 is retained a spring 110 to normally bias the auxiliary tension lever 103 downwardly.

Upwardly of the support shaft 108 is projected an upper limit stopper 111 with which the upwardly pivoted auxiliary tension lever 103 comes into contact.

The printing tape *b* driven on the guide rollers 7, 7′ is wound on the empty reel 5 while being guided by the drawing-out roller 70, a keep roller 71 and a guide shaft 72.

The drawing-out roller 70 and keep roller 71 are mounted above the empty reel 5. The drawing-out roller 70 is a metal roller, which is rotatably mounted on the support shaft 1′, and the keep roller 71 is a rubber roller, which is rotatably mounted on the extreme end of a lever 73 pivotally supported on the support plate 1′, and the rubber roller is biased by means of a spring so that the former comes into resilient contact with the drawing-out roller 70.

The guide shaft 72 is a square or round shaft projected from the support plate 1′ and is non-rotatable.

The printing tape *b* under the receiving roll 2 is drawn out by the drawing-out roller 70, and after having passed over the guide roller 7′ is wound in the form of a letter 'S' between the drawing-out roller 70 and keep roller 72 and subsequently wound back on the guide shaft 72 and then wound into the empty reel 4.

The drawing-out roller 70 is rotated in synchronism with the empty reel 5 to draw out the printing tape *b* on the guide roller 7′ by the fixed amount towards the empty reel 5 to be wound thereon. However, the drawn-out amount of the tape from the tape reel 4 is substantially set by the drawn-out amount of the drawn-out roll 70, and the drawn-out amount has a length somewhat greater than the width of the type 23 for each stroke of the operating arm 14. A tape in length corresponding to the drawn-out amount of the drawing-out roll 70 is drawn from the tape reel 4 by the aforesaid drawing-in mechanism to always maintain constant the stand-by amount of tape between the guide rollers 7 and 100.

The printing tape *b* is wound on the empty reel 5 through non-rotated guide shaft 72 whereby tension is applied thereto and the tape is tightly wound, as a consequence of which a lengthy printing tape may be wound on the empty reel 5. It is noted that if said guide shaft 72 is formed into a hexagonal shaft or a plurality of such guide shafts are provided in a multi-stage manner, these will be more effective.

Next, the roll holder 6 is fixedly mounted on the central portion at the upper end of the machine frame 1, and the holder 6 accommodates and holds therein a generally inverted U-shaped bearing frame 81 which rotatably supports the receiving roll 2 by a support shaft 80.

The roll holder 6 has front and rear walls bored with guide holes 98, 98′ through which stopper shafts 84, 84′ are inserted, and inner walls 82, 82′ bored with opposed longitudinal slots 83, 83′ through which front and rear ends 80′, 80′ of the support shaft 80 extend to be projected outwardly of the inner walls 82, 82′, the guide holes 78, 78′ having stopper shafts 84, 84′ mounted therein so that they may be moved up and down (Fig. 15 and 16).

The stopper shafts 84, 84′ have their upper portions threaded into the upper wall of the holder 6 with upper ends thereof projected from the holder 6, operating portions 85, 85′ being provided on said upper ends; the lower ends of the shafts 84, 84′ are formed with stoppers 86, 86′ on which the ends 80′, 80′ of the support shaft 80 rest.

Accordingly, the lower limit position of the receiving roll 2 is set by the position of the stoppers 86, 86′ located by rotational operation of the stopper shafts 84, 84′, and the lower limit is set so that the lower surface of the receiving roll 2 is positioned lower than a horizontal line which connects the upper surfaces of the guide rollers 7, 7′ as shown in Fig. 2 and 17; in other words, so that both the film sheet *a* and the printing tape *b* are forced down by the receiving roll 2 and positioned in a contacted state under the horizontal line which connects the guide rollers 7, 7′.

An air chamber 87 is mounted on the central portion of the upper wall of the holder 6 and a suspension shaft 89, upwardly biased by means of a spring 88, is inserted into the chamber 87 so that the former may be moved up and down.

The suspension shaft 89 extends through and into the holder 6, the lower end thereof being connected to the central portion of the bearing frame 81 of the receiving roll 2, and an air hose 90, which is connected to a compressor or the like to feed compressed air into the air chamber 87, is connected to the upper portion within the air chamber 87 whereby the suspension shaft 89 is forced down against the force of the spring 88 by air pressure within the air chamber 87.

An air supply source of the compressor or the like is connected to a power source or a driving source of the printer so as to respond

thereto, whereby when the printer stops, a supply of air to the air chamber 87 is automatically stopped by an electromagnetic valve and at the same time, the air chamber 87 is open to atmosphere.

Thus, in use of the printer *B*, air pressure is applied to the interior of the air chamber 87 to downwardly press the receiving roll 2 through the suspension shaft 89 and bearing frame 81, and so the ends 80, 80′ of the support shaft 80 come into contact with the stoppers 86, 86′. When the printer is stopped due to service interruption or cutting of tape, a supply of air to the air chamber 87 is stopped at the same time, air within the air chamber 87 is released to the atmosphere and therefore, the suspension shaft 89 is moved up by the resilient force of the spring 88 and the receiving roll 2 is accordingly moved up with the ends 80′, 80′ thereof placed along the slots 83, 83′ to return the film sheet *a* and the printing tape *b* to a substantially horizontal position due to the tension thereof (the dash-dotted contour lines of Fig. 17).

Since, accordingly, the film sheet *a* is moved away from the types 23, 23 (being heated), it is possible to prevent the sheet *a* and printing tape *b* from being damaged by burning.

Fig. 18 shows a modified embodiment in place of a construction for pressing down the suspension shaft 89 by air pressure as described above. Reference numeral 91 designates a solenoid and 92 a lever formed from a parallel link. A head 93 provided on the extreme end of the lever 92 is moved up and down. The lever 92 has a projection 94 downwardly projected therefrom which comes into contact with the upper surface of the suspension shaft 89 and has a returning spring 95 mounted upwardly thereof.

In Fig. 2, reference numerals 96, 96′ and 96″ designate gear mechanisms for transmission of power, and reference numerals 97, 98, 99 designate belt transmission mechanisms.

The printing operation of the printer *B* constructed as described hereinbefore will now be described. Upon full rotation of the rotational shaft 106 from the position shown in Fig. 2, the eccentric shaft 13 and rotary disc 18 fully rotate and the operating arm 14 is pivotally moved through one stoke as shown by the arrow *S* in Fig. 4, during the forward movement of which at the intermediate position, the types 23, 23, of the type head 3 are somewhat forcibly joined with the receiving roll 2 and urged against the film sheet *a* through the printing tape *b* (the dash-dotted contour line of Fig. 4) to momentarily print characters (such as date of manufacture) of the types 23, 23, on the film sheet *a*. Immediately after printing has taken place, the printing tape *b* is delivered through 10 to 25mm along the movement of the type head 3 resulting from the pivotal movement of the operating arm 14. This delivery of the tape is accomplished by the upward pivotal movement of the auxiliary tension lever 103 and by the movement of the drawing-in roller 102 towards the untightening side of the tape, and pulling of the tape from the reel 4 is not accomplished.

That is, the delivery of the tape during the aforesaid foreword movement is covered by the stand-by amount of the printing tape *b* interposed between the guide rollers 7 and 100.

Next, when the operating arm 4 is moved backward under the printing tape *b*, the drawing-in roller 102 is moved towards the side where the tape is tensioned. However, in an initial time, the auxiliary tension lever 103 is pivotally moved upwardly until it comes into contact with the stopper 111, and thereafter the tape tensioned to draw-in the printing tape *b* from the tape reel 4 through the guide rollers 54, 100 and 101, the drawn-in amount thereof corresponding to the drawn-out amount of the drawing-out roller 70. That is, even if the drawn-out amount of the drawing-out roller 70 is somewhat uneven, the tape is supplemented, to compensate for such an unevenness, between the guide rollers 7 and 100 according to the drawing-out amount, irrespectve of the quanitity thereof to make the stand-by amount of tape between the rollers 7 and 100 constant.

Upon termination of backward movement of the operating arm 14, the auxiliary tension lever 103 is pivotally moved and returned to its original position by the resilient force of the spring 110, and the backward movement of the lever 103 causes the printing tape *b* under the receiving roll 2 to be pulled back towards the guide roller 7 to again assume the state shown in Fig. 2.

Accordingly, the stand-by amount of tape interposed between the guide rollers 7 and 100 is always maintained constant, as a consequence of which the printing tape *b* under the receiving roll 2 is moved through the length of tape drawn out by the drawing-out roll 70 towards the guide roller 7′. Said amount of movement is shorter than 10–25mm drawn when the operating arm 14 is moved forward and is somewhat longer than the width of the type 23.

The printing tape moved towards the guide roller 7′ during operation of the operating arm 14 by one stroke, is wound on the empty roll 5 through the guide shaft 72 by rotation of the drawing-out roller 70 and empty reel 5.

Thereafter, the same stroke operation as the aforementioned operation is repeated. A using spot (position where the type comes into contact) of the printing tape *b* after that is a rear position somewhat spaced from the previous using spot.

Fig. 19 shows an improvement wherein a projection 120 is integrally projected on the extreme end of the auxiliary tension lever 103, and a switch 122 is disposed on a portion of the support plate 1' close to the projection 120 so that when the lever 103 arrives at the lower limit position, the projection 120 is brought into contact with the switch 122 to stop the printer *b*.

By the structure shown in Fig. 19, a cut in the printing tape *b* downstream of the guide roller 104 may be detected to stop the printing operation of the printer *B*.

Figs. 20 and 21 show a construction wherein a guide plate 130 for slidably receiving the printing tape *b* and film sheet *a* is horizontally disposed under the receiving roll 2, more specifically between the guide rollers 7 and 7'. The guide plate 130 is in the form of a flat plate bored with a window hole located in a portion opposed to the receiving roll 2, and the plate 130 has tongues 132, 132' projected on both left and right sides, respectively, on the undersurface thereof. Links 134, 134' are connected between both the tongues 132 and 132'.

The guide plate 130 has the links 134, 134' pivotally mounted by support shafts 138, 138' on bearings 136, 136' provided on the support plate 1' so that the guide plate 130 may be moved up and down while maintaining its horizontal attitude by the pivotal movement of the link 134.

The guide plate 130 causes a push-up pin 140 upwardly biased by means of the spring to abut with the lower surface of the tongue 132' so as to always forcibly move the plate 130 upwardly, whereby the guide plate 130 is made to assume a position upwardly spaced from the guide rollers 7, 7'.

The upper limit position of the guide plate 130 is set by a stopper 142 against which the link 134' comes into contact, whereas the lower limit position (position flush with the guide rollers 7, 7') of the plate 130 is set by the push-down of a pusher 144 which is moved up and down with the receiving roll 2.

Thus, in the printing state, the guide plate is held at the lower limit position by the pusher 144 which is moved down along with the receiving roll 2 and the type 23 of the type head 3 comes into contact with the printing tape *b* (Fig. 20). When the printer *B* is stopped and the receiving roll 2 and pusher 144 are moved up, the guide plate 130 is moved up by the resilient force of the push-up pin 140 to raise the printing tape *b* and film sheet *a* away from the type 23 (Fig. 21).

Accordingly, it is possible to prevent the film sheet *a* and the printing tape *b* from being damaged by burning.

Figs. 22 to 24 show the details of a wiring construction of the heater lead wire 36 and sensor lead wire 36' shown in Fig. 2. In this construction, wiring is provided so as not to impede the pivotal movement of the support disc 34, a bundling construction is simplified and breaking of wire is minimized.

In these figures, reference numeral 150 designates a coil spring, 152, 152' silicon rubber tubes, 154, 154' silicon rubber, 156 silicon rubber, and 158, 158' silicon rubber.

In the aforementioned printer *B*, on the side of the empty reel, there is provided the drawing-out roller for drawing out the printing tape under the receiving roll by a fixed amount towards the empty reel, and between the tape reel and the receiving roll are provided the tape drawing-in mechanism for pulling out and supplementing the printing tape in amount corresponding to the drawn-out amount of the drawing out roller from the tape reel, and the pivotable auxiliary tension lever for always biasing the printing tape under the receiving roll in a returning direction. With this arrangement, the fixed amount of stand-by amount of tape secured by the drawing-in mechanism and auxiliary tension lever is provided between the tape reel and the receiving roll, and the printing tape is delivered accompanied by the type head immediately after the printing operation is accomplished by the type head. This delivery is covered by the stand-by amount of tape followed by the pivotal movement of the auxiliary tension lever, and thus, the tape need not be pulled out of the tape reel and damages such as stretching or cutting of tape can be prevented.

Accordingly, even if the linear speed of the type head, in other words the transporting speed of the packing sheet, is increased, damage such as stretching or cutting of tape can be prevented. Therefore, it is possible to accomplish printing operation at a high speed while moving the packing sheet at a high speed. In addition, the weight inertia of the tape reel does not lead to damage such as stretching of tape and therefore, it is possible to increase the diameter of the reel to use a lengthy tape.

Furthermore, the stand-by amount of tape is supplemented by the tape drawing-in mechanism according to the drawn-out amount of the drawing-out roll to effect printing operation irrespective of heavy or light load on the tape reel side. Therefore, unevenness of tape feed is small, and even if it is so, the stand-by amount is not affected thereby. Thus, it is possible to positively set the feed of printing tape, that is, the spacing of printing position of the tape as small as needed, thus effectively utilising the tape.

CLAIMS

1. An automatic packing machine including a roll of packing sheets into which packing sheets are wound and a printer are disposed on a machine body of the printing machine, and a packing sheet drawn out of

said roll is drawn out to a packing position through the printer, in which printer the packing sheet is transported under a receiving roll, a printing tape drawn out of a tape reel and wound on an empty reel is disposed along said packing sheet, and a heated type is pressed against the receiving roll through the packing sheet and printing tape for rotation to apply printing to the packing sheet.

2. An automatic packing machine according to Claim 1, wherein the printer includes a drawing out roller for drawing out the printing tape under the receiving roll by a fixed amount towards the empty reel provided on the side of the empty reel, and between the tape reel and the receiving roll are provided a tape draw-in mechanism for pulling out the printing tape from the tape reel in accordance with the drawn amount of said drawing roller for supplement thereof and an auxiliary tension lever for always urging the printing tape under the receiving roll in a returning direction, said lever being pivotally mounted.

3. An automatic packing maching according to Claim 1 or Claim 2, wherein said type head is mounted on an extreme end of an operating arm which is pivotally moved under the receiving roll.

4. An automatic packing machine according to Claim 1 or Claim 2, wherein said type head is mounted on an extreme end of a lever which is pivotally moved under the receiving roll.

5. An automatic packing machine according to any of Claims 2 to 4, wherein in the neighbourhood of a support shaft which rotatably supports said tape reel there is provided a pivotable tension lever having a pivot at a left obliquely upper portion of said support shaft and the printing tape is led from the tape reel to a tape drawing-in mechanism through said tension lever, a micro-switch being provided to stop driving of the printer when the tension lever is excessively pivotally moved up or down.

6. An automatic packing machine according to any of Claims 2 to 5, wherein a switch is provided to stop the printer when the auxiliary tension lever reaches its lower limit position.

7. An automatic packing machine according to any of the preceding Claims, wherein said packing sheet and printing tape are disposed in a relation suitably spaced from the type head, a push-down mechanism for moving the receiving roll to the printing position of the printing head only when the printer is operated being linked to the receiving roll.

8. An automatic packing machine according to Claim 7, wherein said push-down mechanism is designed so as to push down a bearing frame which supports the receiving roll by air pressure, upward movement of the bearing frame being accomplished by the resilient force of a spring in the state where air is stopped.

9. An automatic packing machine according to Claim 8, wherein said push-down mechanism comprises a solenoid for moving the bearing frame downwardly and a lever comprising a parallel link.

10. An automatic packing machine according to any of the preceding Claims, wherein the printing tape and packing sheet are slidably received under the receiving roll, and a guide plate bored with a window hole in a portion opposed to the receiving roll is disposed movably up and down whereby said plate is moved down to a printing level when the receiving roll is moved down, and is moved up when the receiving roll is moved up, to pull the printing tape and packing sheet away from heated types when the machine is stopped, thereby preventing damage by burning.

11. An automatic packing machine constructed and adapted to operate substantially as herein described with reference to and as illustrated in Figs. 1 to 17 and 20 to 24, or Figs. 1 to 17 and 20 to 24 as modified by Fig. 18 or Fig. 19.

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